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COMPLIMENTS OF

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RECTIFICATION OF CLUB-FOOT IN ADULTS

WITH THE PRESENTATION OF A CASE

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THE fact that in any of our large cities a considerable number of club-feet in adults may be seen is testimony that the principles of treatment of this affection are not thoroughly understood or at least are not well carried out in practice. I once had a practicing physician who had in his time done considerable surgery, say to me: "Yes, Doctor, I have operated on a good many cases of club-feet but I have quit the whole field." Upon being asked how that came about he replied: "Because I never cured a case yet."

Bradford and Lovett in their work on Orthopedic Surgery make the following statement: "The literature of the treatment of club-foot is too often that of unvarying success. It is sometimes as brilliant as an advertising sheet and yet in practice there is no lack of half-cured or relapsed cases, sufficient evidence that the methods of cure are not universally understood." A. M. Phelps of New York in an article on the open incision method, says that "primary osteotomy, astragalus resection, cuneiform tarsectomy, open incision and prolonged and interrupted traction with intricate machinery have all run the gauntlet of observation and the roadside is strewn with lamentable failures."

In 1897 the writer's attention was called to three cases of club-foot in young adults in which the surgeon amputated the offending member. I once saw one of New York's distinguished surgeons operate on the club-foot of a man about thirty, but after a prolonged futile effort at rectification he returned the patient to his room with his foot no straighter than when he went on the operating table. Nevertheless in spite of the above-mentioned failures, I would state the following proposition: It is my belief that by tenotomies, the open incision, the removal of a tarsal wedge, and the removal sometimes of the astragalus, the feet in the worst cases can be brought to the normal position; not that the feet in the severer forms found in adults will be perfect, but, though the motion at the ankle is not great and the elasticity and form of the arch is wanting and perhaps the feet are somewhat misshapen, yet will they be so much superior to the condition in which the surgeon finds them that the propriety of the above-described operations cannot be questioned. Such results certainly preclude the thought of amputation.

Before proceeding to the subject of treatment, a brief study of the anatomy of the foot with relation to this deformity will help us to appreciate what ought to be done.

Read before the Cleveland Medical Society, February 10, 1899

Presented by the author

Anatomy.—In congenital talipes we find both ligaments and bones involved. In bone the variation from the normal consists mostly in a change of axes of the planes of the articular surface. There is also some change in the shape of the bones. In the ligaments the change consists in a shortening on the inner or concave side of the foot and a lengthening of the outer or convex side. The ligaments therefore very materially assist in holding the foot in the deformed position. In *talipes equinovarus* the foot is held extended (upon the leg) and flexed upon itself and inverted, with the toes turned inward. The patient stands on the outer border and front portion of the foot and, when the deformity is extreme, on its dorsum. The weight of the body in walking tends to increase the deformity, and pressure produces bursas and callosities on its outer border. Flexion at the ankle is prevented by the shortened *tendo Achillis* and in some cases by the shortened posterior portions of the lateral ligaments while eversion and extension at the mediotarsal joint is prevented by the *tibialis posticus*, deep flexors, fascia and ligaments of the sole and inner side of the foot. The *os calcis* is drawn from a horizontal to a more or less vertical plane while its anterior portion or head is frequently twisted inwards. The cuboid by reason of its ligamentous connection, follows the inward twisting of the head of the *os calcis*. The astragalus, on account of being wedged in between the malleoli, does not admit of much internal rotation, but its abnormality of position consists of a rotation forward and downward on the horizontal axis, the result of which is that only the posterior portion of its superior articular surface comes in contact with the tibia and the anterior part of the articular surface projects beneath the skin of the dorsum of the foot. Another factor recognized as of importance in the production of equinovarus and which also retards correction, is a change of the angle of the neck of the astragalus with the body of the bone. The neck of the astragalus in the infant foot turns inward upon the body of the bone to an angle of 38 degrees, while in the adult it turns in 26½ degrees. This shows that the tendency of growth is to straighten the neck of the astragalus and is interesting from an evolutionary standpoint as a large angle between the neck of the astragalus and the body of the bone is considered normal in the monkey. In club-foot this angle is increased from the normal to as great as 60 degrees. The result of this abnormality is to approximate the scaphoid and inner malleolus, frequently to the extent of their coming in contact, in which cases facets are formed. On mechanic principles the inner border of the foot with this deformity must be more twisted than the outer border so that we may have a marked angle formed on the inner border while there is only a gentle curve on the outer border. This also produces a spreading-out of the front part of the foot like a fan, making it broad in proportion to the rest of the foot. The changes which the ligaments have undergone form an obstruction to cure, except in the milder cases. The plantar and internal lateral ligaments are the ones chiefly involved. It has been found on dissection that the deformity persisted after removing the muscles and that reduction was not possible until certain ligaments had been divided. In infancy the shortened muscles are

but a weak resistance and their division at this early age is not especially to be recommended.

For the rectification of club-foot in adults I will discuss the following measures: (1) Brisement Force; (2) Tenotomy, fasciotomy and section of ligaments combined with force; (3) Open incision method (Phelps); (4) Astragaloid osteotomy; (5) Tarsal resection; (6) Removal of astragalus.

(1) Force applied to the foot directly by the hands or by the intervention of mechanic devices is required to a considerable degree in the case of adults and it is the inability to apply a considerable force that accounts for many of the failures to cure adult club-foot. In the case which I present to this society tonight had I not had the assistance of the powerful instrument known as the Phelps Club-Foot Breaker, by which it is claimed that a ton's pressure may be applied, I would undoubtedly have failed to rectify the deformity. It was this inability to apply sufficient force that led to the failure of the distinguished New York surgeon previously referred to. Manual or mechanic force may be used alone to rectify the deformity but is generally used in connection with one or more of the operations above mentioned. From some unfortunate experiences which I have had in which sloughing of the skin took place, though I was easily able to rectify the deformity by manual force, I have been led to the following conclusion: The skin in the case of some adults and older children will not stand the amount of stretching necessary to bring the foot into good position, but sloughing will take place. Therefore in these cases tenotomies and tarsoclastis will be unsatisfactory, though sufficient to correct the deformity.

(2) In all but the mildest cases of club-foot in adults tenotomy of at least the *tendo Achillis*, fasciotomy in the sole of the foot and in many the section of ligaments in connection with considerable force will be required.

To carry out the method I am now speaking of the foot is prepared antiseptically and by the use of a small fascia-knife the tense bands of fascia in the sole of the foot are subcutaneously divided. This same knife may be used to cut the tendons in children but for adults a somewhat longer-bladed knife is used. The anterior bands of the internal lateral, the astragaloscapoid and the calcaneoscapoid ligaments are cut and then by means of manual force, using a triangular block of wood well-padded over which to twist the foot, the talipes is overcome; or if this force is insufficient the Thomas Tarsoclast may be used and, this failing, Phelps club-foot breaker may be brought into play.

(3) But in many cases, as previously suggested, the tissues and especially the skin will not sustain the required force necessary to correct the deformity in which case Phelps' open incision is the proper operation. "Exclude all cases which by manipulation or force can immediately or in a reasonable length of time be cured, then the following rule should be followed: Cut the contracted parts as they first offer resistance, cutting in the order of those parts which first contracted when the deformity was produced. The operator will then proceed, after strong manipulation or force is applied with a club-foot machine or hands, to subcutaneously divide the *tendo Achillis*. If

the skin is not short subcutaneous tenotomy in the sole of the foot will usually suffice. If the skin is short an open incision one-fourth the distance across the foot can be made beginning directly in front of the inner malleolus and carried down to the inner side of the neck of the astragalus. Through this incision the following tissues can be cut, if they offer strong resistance, in the order named (a) Tibialis; (b) *abductor pollicis*; (c) plantar fascia through the wound; (d) *flexor brevis* muscle; (e) long flexors; (f) deltoid ligament or its branches."

Moore of Minneapolis in his recent work on Orthopedic Surgery, in speaking of this operation, says: "Dr. Phelps uses a powerful machine of his own invention by which he applies great force to overcome the deformity after making the incision, and by this means is undoubtedly able to cure cases that would otherwise require some bone operation. He advises tenotomy of the *tendo Achillis* at the same setting, but one who does not have a machine will do better to leave this tenotomy until later since this shortened tendon holds the heel firm so that the varus can be overcome." Other writers differ from Phelps on the question of when to cut the *tendo Achillis*. For my own part my experience has led me to agree with Phelps for I have found in a number of instances that after cutting the *tendo Achillis*, the foot was still absolutely firm showing that the resistance was ligamentous, being the posterior fibres of the internal and external lateral ligaments and these are so situated that cutting would seem out of the question or at least the attempt would hazard the blood and nerve supply of the foot. We have then only left the use of great force and to apply this force we need the use of the leverage of the whole foot which we could not have if the open incision had previously been done. In the patient I present to you tonight there was absolute firmness after cutting the *tendo Achillis*, and I would have been unable to have gotten down the heel had I first made the open incision. As for the varus I have always been able to overcome that without the need of *tendo Achillis* as a point of resistance. I accomplish this by making the incision across the sole a free one and then break down the high arch using the triangular block as a fulcrum, one hand at the heel and the other at the ball of the foot being the power and resistance. After the deformity is rectified a piece of rubber-tissue is placed next to the wound, next a surgical dressing and over all a plaster-of-paris dressing is applied.

In 93 cases reported by Phelps the average time of healing of the primary wound was four weeks; the duration of after-treatment averaged ten months; on the fourth month after operation the feet were all straight.

(4) In a certain number of cases of club-foot in adults it will be found that the open incision followed by force is not sufficient to entirely overcome the deformity, but that some bone-operation is required. If by the knowledge obtained in doing the open incision it is determined that the neck of the astragalus is rotated inwards, by means of an osteotome the bone can be fractured and the foot thereby allowed to be rotated further outward. Bradford in a recent article on relapsed club-foot has forcibly called attention to the fact that the head of the *os calcis* is in a certain number of cases twisted inwards in a manner similar to that of the astragalus and recommends in a

like manner that an osteotomy be done for its correction, reporting at the same time a number of satisfactory results following this procedure.

The relative merits of the wedge-shaped tarsectomy and enucleation of the astragalus have been widely discussed by those interested in bone-surgery and we still find a considerable difference of opinion on that subject. The objection raised to the tarsal resection is that (1) it shortens the foot; (2) it impairs the osseous arches; and (3) it removes all chance of future restoration by orthopedic measures. The second and third objections can be raised to the enucleation of the astragalus and besides there is the additional objection that it shortens the length of the limb and in after-life the ankle may broaden by the spreading of the tibia and fibula allowing the latter bones to sink further down over the *os calcis*. There are a certain number of writers, however, who highly commend the operation of astragaloid enucleation while others, as for instance Moore of Minneapolis, prefer the tarsal resection. My own preference is for tarsal resection where removal of the bone is necessary, but it is only in the severer cases of club-foot in adults that I find the sacrifice of bone is required.

(5) After an Esmarch bandage is applied an incision is made from the tip of the outer malleolus in a direction downward and forward far enough to allow sufficient retraction of the skin-flap to give room for the osteotomy. The soft parts are separated from the bone by a periosteotome and held by retractors when a wedge-shaped piece is removed sufficiently large to allow the foot to be straightened. The section may include a portion of the *os calcis* and a portion of the cuboid, or the entire cuboid and part of the fifth metatarsal may and has been removed. My own choice is to take the entire wedge from the anterior portion of the *os calcis*, saving the articular surface if possible in order to allow motion between the *os calcis* and cuboid upon recovery. When operating upon children enough bone should be removed to over-correct the deformity, but in adults a complete correction of the deformity is sufficient, for in the latter cases the tendency to relapse after a complete correction of the deformity is very slight. The wound should be carefully washed out to remove any fragments of bone that may be in the wound, the wound stitched and a surgical dressing and plaster-of-paris is applied.

(6) For the enucleation of the astragalus an incision is made from above the tip of the external malleolus forward and a little inward curving toward the dorsum of the foot. This incision crosses a space between the peroneal tendons, in which no important structures are found. The bone having been exposed is removed with chisel, gouge, and forceps, after which the foot is put in the corrected position and dressed antiseptically with plaster-of-paris over all.

As a reiteration then I would say it is my belief that any club-foot even in an adult can be corrected by means of tenotomies, the open incision, the removal of the tarsal wedge or osteotomies of the neck of the astragalus and *os calcis* and the removal sometimes of the astragalus, the above-named measures being combined with the use of strong manual force and if necessary powerful mechanical appliances, the club-foot machine of Phelps probably being the most effective.

Case: Julia M., age 30, referred to me by Dr T. A. Burke. The patient was born with equinovarus of both feet. She had her feet both operated on when she was a small child. The left foot was somewhat improved by the operations, but the right foot relapsed. The right foot which came under my care was held in the position recognized as moderately severe equinovarus. There was very little motion at the ankle-joint and the angle of greatest flexion was 120 degrees. The foot was rotated inward to an angle of 45 degrees, the patient walking on the outer and forward part of the foot. Callosities had formed on the outer border of the foot and it was the sensitiveness and pain from these, rendering walking nearly impossible, that forced the patient to seek relief.

On February 2, 1898, the patient being under ether the deformity in the right foot was rectified. From my note-book I take the following: The *tendo Achillis* was first cut but I found myself unable by manual force to correct the deformity in the least, so I applied Phelps' club-foot wrench, with which I was easily able to bring about flexion. Then I did a Phelps' open incision and was able to get the foot in an over-corrected position, flexion being permitted to about 75 degrees. A surgical dressing was applied and over this plaster-of-paris.

February 4: Last evening toes began to swell so I cut open plaster dressing. This morning had to open dressings widely to restore circulation in the toes.

February 9: Foot redressed, no suppuration and wound is filling rapidly. I again put the foot in plaster-of-paris in an excellent position.

February 18: The big toe red and congested for the last two days but is now somewhat better.

February 19: Big toe nearly normal in appearance.

From this time on nothing of consequence occurred other than the regular healing process. The formation of normal skin over the filling granulations was rather slow, requiring about two months before being completed. The foot was ready for a walking-shoe in a little over three months, the patient not being required to wear a brace. I would here state that in adults when the deformity is thoroughly corrected by an operation a brace, if required at all, need only be worn for several months, and in many of the cases no brace is required whatever, though a properly devised and especially made shoe should be worn. The patient here spoken of is wearing a specially devised shoe, the sole being thicker at the outside and toward the toe. Especial provision has to be made for several of the old corns which have not as yet entirely disappeared.

477 Prospect Street

DISCUSSION AT REGULAR MEETING OF THE CLEVELAND MEDICAL
SOCIETY, FEBRUARY 10, 1899

Dr James Fraunfelter, Canton: I came up to hear this lecture and I was also interested in Dr Martin's subject. I am very glad I came, as the treatment of talipes equinovarus has been demonstrated to me very clearly and thoroughly. Of course we read of these operations, and how the deformity

is corrected. For instance, we know of Dr Phelps' treatment, who has been mentioned in the paper; but I had never seen the instrument he uses until this evening and I can readily see what force can be applied with it.

If it would not be uninteresting to the Society I will speak of my case. The case is one of an adult, a lady about thirty-five years of age. The trouble in the foot was acquired. The condition was that of talipes equinovarus, which we attempted to correct and did correct. This, of course, was a charity patient. Those are the kind of patients that cause us the most trouble. This was a patient upon whom the Doctor and I performed oophorectomy, trachelorrhaphy, colpoperineorrhaphy, operation for the removal of hemorrhoids, and for rectovaginal fistula; and last, but not least, the correction of talipes equinovarus.

We did not have the Phelps' apparatus for force as we did not need it. In fact, I did not know the case was to be operated upon until that day, but she made the request in my presence that the foot be operated upon because this was the last operation, closing up the fistula. We divided the *tendo Achillis* and as the integument on the palmar surface of the foot was much contracted, and also the plantar fascia, that was divided according to Phelps, making the open incision and sufficient force used to bring the foot down in proper position, an antiseptic dressing applied and put into plaster-of-paris. That was the last time (and the first) that I ever saw the foot.

There is an interesting part in this case for those of you who may assist or even give an anesthetic for a surgeon; that is the capacity in which I acted in this case—simply an anesthetizer. Yet I am associated with him and liable to pay whatever damage they may get—ten thousand dollars I suppose. So you want to be sure of the kind of a case in which you assist Dr Wirt. According to the law this is true; that an anesthetizer or assistant is equally liable with the one who does the operation. It was new to me and it may be to you. I suppose the law applies in Cleveland the same as it does in Canton. This is about the situation of our case. The case of course went out of the Doctor's hands. After she left the hospital he went to her house and put on another plaster-of-paris dressing. In the mean time a skin disease developed and the patient was very miserable and much out of patience as that kind of cases always are. She drifted around from one physician to another. Finally she recovered from that disease and the case has resulted in a law suit. The suit is brought for having done this operation without her consent; for having it done bunglingly; for having used extreme force, etc. Those are the charges. Of course there is nothing in any of the charges; but we as physicians must stand up and be knocked down and used as the lawyers want to use us. Her aunt who lived in Cleveland agreed to get a brace, which she never did. They preferred to have a lawsuit first. The consequence is that she has not the benefit she would have had if the leg had been attended to; and I venture to say the foot is not in as good shape as it should be because of their neglect. But should this patient wear a brace she could stand on the palmar surface of the foot pretty squarely, or could when the operation was done; and if she had done as she was directed to do she would have derived much benefit from the operation.

The foregoing is the history of this, to me, most interesting case; probably more interesting to me than to most of the gentlemen here; but if you were in my boots it would be more interesting than it is now.

Dr House: I want to ask whether, in sloughing of the skin which Dr Wirt mentioned, he would keep on his plaster cast or bandage in a case of that kind.

Dr W. E. Wirt: In club-foot due to infantile paralysis there is considerable less force required to correct the deformity than in congenital cases. For instance: at the time that I operated on the lady I was to have had here tonight I operated on a girl of sixteen with about the same condition of foot so far as deformity was concerned, due to infantile paralysis. In that case, after cutting the *tendo Achillis* I did not have to use the machine at all; because this deformity coming on as a result of paralysis the ligaments were not so strong and the shortening did not occur to the same extent and the parts were more normal originally; so after cutting the *tendo Achillis* the parts came into position without much force. This corresponds with what Dr Fraunfelder has said; that they were able to correct the deformity without the use of so much force as I employed.

Another thing, in regard to the use of appliances afterwards. I said in my paper that appliances in adult cases were not required for any considerable time. I was talking of congenital cases. In paralytic cases appliances may have to be worn, possibly indefinitely, because the same condition which brought about the deformity still exists. The muscles on one side of the leg being stronger than those on the other side brings about the deformity. You may rectify the deformity, but the condition may recur. So in those cases the patient should wear a brace, and may have to wear it indefinitely.

In regard to the sloughing of the skin. I remember one particular case very forcibly. A woman forty-four years of age; rather weak and delicate, who was apparently not over-blessed with cerebral powers, but who had a very strong will, insisted on having the club-foot straightened at that age. I found I could straighten the foot by manual force, which I did and it did not seem to me I used a great deal of force. Her feet were very pliable. Right away I noticed the circulation was not returning in the foot; within an hour or two I cut down the plaster and spread the edges, but still the circulation did not return. Then I had the plaster opened entirely and took the foot partly out, but in spite of this the slough took away the skin on the entire side of the foot and around the heel where there had been no pressure at all, showing that the skin would not stand the stretching at all.

Another case was a boy ten or eleven years of age. In that case I used the tarsoclast and the circulation returned in all but the two great toes and the second toe on the left foot. As soon as it was reported to me I had the plaster-of-paris loosened up and finally spread apart. The circulation in that case in the left foot did not return in the big toe and second toe and for about two inches along the dorsum and side of the foot. The skin sloughed away and the ligament of the great toe also, so that I lost two toes, and the skin was several months in healing over.

This unfortunate attempt taught me a lesson, that while you could straighten those cases, even with manual force, if the skin is short it is better to cut the skin and the healing will take place in a month. If you have sloughing it will be a matter of two or three months until the foot is entirely well.